Claims

1. A casting nozzle having a molten steel flow hole portion in which a plurality of independent protrusion portions and/or concave portions discontinuous in both directions parallel and perpendicular to a molten steel flowing direction are disposed, wherein each of said protrusion portions and/or concave portions has a size satisfying the following expressions (1) and (2):

$H \geq 2$ (unit: mm) ··· expression (1)

$L > 2 \times H$ (unit: mm) ··· expression (2)

in which "H" shows the maximum height of the protrusion portion or the maximum depth of the concave portion, and "L" shows the maximum length of a base portion of the protrusion portion or concave portion.

2. The casting nozzle according to claim 1, wherein each of said protrusion portions and/or concave portions satisfies the following expression (3):

$L \leq \pi D/3$ (unit: mm) ··· expression (3)

in which "L" shows the maximum length of a base portion of the protrusion portion or concave portion, and "D" shows the inner diameter (diameter) of the nozzle before the protrusion portions or concave portions are disposed (π: the ratio of the circumference of a circle to its diameter).

3. The casting nozzle according to claim 1 or 2, wherein said protrusion portions and/or concave portions are disposed so that the inner surface area of a molten steel flow path in a range in which said protrusion portions and/or concave portions are disposed is 102-350 % as large as the inner surface area of the molten steel path before disposition of said protrusion portions and/or concave portions.

4. The casting nozzle according to any one of claims 1 to 3, wherein said casting nozzle has a portion where said protrusion portions and/or concave portions are disposed so zigzag that positions are displaced at least in the direction perpendicular to the molten steel flowing direction.

5. The casting nozzle according to any one of claims 1 to 4, wherein said protrusion portions and/or concave portions are disposed in the whole or part of the molten steel flow hole portion of the casting nozzle.

6. The casting nozzle according to any one of claims 1 to 5, wherein said protrusion portions and/or concave portions are disposed so as to be not higher than a meniscus of the casting nozzle.

7. The casting nozzle according to any one of claims

1 to 6, wherein the distance between bases of said protrusion portions in a direction parallel to the molten steel flowing direction is not smaller than 20 mm.

8. The casting nozzle according to any one of claims 1 to 7, wherein the height of each of said protrusion portions is 2-20 mm.

9. The casting nozzle according to any one of claims 1 to 8, wherein the number of said protrusion portions disposed in the molten steel flowing hole portion is not smaller than 4.

10. The casting nozzle according to any one of claims 1 to 9, wherein the "angle between a nozzle inner pipe and a lower end portion of each of said protrusion portions" in a direction parallel to the molten steel flowing direction is not larger than 60°.

11. The casting nozzle according to any one of claims 1 to 10, wherein said protrusion portions are molded so as to be integrated with a body of the casting nozzle.

12. The casting nozzle according to any one of claims 1 to 11, wherein said casting nozzle is an immersion nozzle

for continuously casting steel.